

STAFF REPORT

INFORMATION ITEM
REGULATION OF ASR PROJECTS IN THE CENTRAL VALLEY REGION
GENERAL STRATEGY

Background

Aquifer Storage and Recovery (ASR) projects are being considered by a number of municipalities to increase their drinking water supplies by pumping surface water underground in times of abundant supply and extracting water from the same aquifer in times of need. In contrast to other types of conjunctive use projects, ASR projects use treated drinking water as the source of injected water. The presence of constituents from the raw source water along with disinfection byproducts formed during chlorine disinfection has caused Regional Board staff to raise concerns over groundwater quality impacts that may affect users of the aquifer other than ASR project proponents.

In April 2003, the Board adopted, as an uncontested item, a conditional waiver of WDRs for the test phase of a new ASR project for the City of Roseville. Even though the project involved a high-quality raw water source (Folsom Lake) chlorine-disinfection would occur prior to injection. As such, the waiver required monitoring to determine potential aquifer degradation by disinfection byproducts.

The City of Tracy requested a similar waiver for the test of an ASR system that would also utilize chlorine-disinfected water, in this case drawn from the Delta-Mendota Canal, a lower-quality raw water source. In September 2004, staff brought an information item on ASR to the Board, along with a tentative waiver that would have permitted two test rounds of injection and extraction for Tracy. Due to uncertainty over potential groundwater quality impacts and alternatives associated with this technology, the Board tabled the waiver and instructed staff to seek additional information from the Discharger.

The Board has not yet been asked to approve long-term implementation of any ASR projects.

In March 2005, the Groundwater Resources Association of California (GRAC) sponsored a two-day workshop on artificial recharge, at which staff from the Central Valley, Lahontan, and Santa Ana Regions and the State Board's Division Water Rights presented perspectives on this topic. As a follow up, GRAC held a *Legislative Symposium* on 18 May, at which several stakeholders made presentations, including the City of Roseville, the Department of Water Resources, the Sacramento Groundwater Authority, the Metropolitan Water District of Southern California, Central Valley Regional Board staff and State Board staff.

Discussions at these workshops, along with meetings between City of Roseville, Department of Water Resources and Regional Board staffs resulted in the development of a general regulatory strategy for ASR that Regional Board staff believes will balance the need for water quality protection with the need to enhance future water supplies. Staff has developed a proposed waiver for the next test of Roseville's ASR Project, based on this general strategy.

Discussion of Issues

Conjunctive use involves the joint management of surface water and groundwater resources to enhance water supplies. There are two general types of conjunctive use projects. Spreading basins can be used to percolate surface water into the subsurface, for later withdrawal via wells. Deleterious substances present in the source water are likely to be filtered out as the water travels through the soil column. Other

conjunctive use projects use wells to directly inject water into an aquifer and to extract it for use. In many cases, these direct injection projects, also called Aquifer Storage and Recovery or “ASR”, are directly connected to municipal drinking water treatment and distribution systems.

Conjunctive use projects provide a benefit to California by allowing expansion of available water supplies. The California Bay-Delta Authority and the Department of Water Resources recommend conjunctive use technology and provide grant funding for these kinds of projects. With these incentives and barriers to building new constructed water supply projects, we expect to see more conjunctive use projects in the future, including Aquifer Storage and Recovery.

Why should the Water Boards be concerned with Aquifer Storage and Recovery projects? In these projects, water from one resource is discharged into another. Injected water may be of very different quality than groundwater in the aquifer. The discharge may degrade or even pollute the groundwater resource. Most ASR projects propose to use an existing drinking water treatment and distribution system as the source of injected water, to avoid the cost of installing separate raw-water piping. While the injected water meets all drinking water standards and, as such, satisfies the water quality needs of the project proponent, it may contain substances that could degrade the quality of the groundwater to a degree that other current or future domestic, municipal, agricultural or industrial uses and users may be adversely affected.

Disinfection of drinking water with chlorine creates chemical byproducts including trihalomethanes (THMs; such as chloroform), haloacetic acids, and NDMA. These chemicals are not present in most groundwater aquifers. Many of these chemicals are considered to cause cancer in humans. There also may be substances in the injection water that came from the raw source water. Waste discharges, and agricultural and urban runoff, upstream of the water intake may have added substances, such as pesticides, pharmaceuticals, endocrine disruptors and salt that are not removed by conventional drinking water treatment processes. Many of these substances are not regulated in drinking water. Owners of aquariums are well aware that their fish may die if placed in tap water.

Drinking water standards for disinfection byproducts, such as trihalomethanes, are developed so as to accept some cancer risk, in order to achieve the benefit of pathogen removal at relatively low cost. But most groundwater is pathogen free. Injecting chlorine-disinfected water into an aquifer would subject users of that water to cancer risk, without providing them with any benefit. The federal drinking water standard for trihalomethanes was recently lowered due to these health concerns. Even with these changes, the standard is not completely health protective.

Compliance only with drinking water standards could allow high quality groundwater aquifers to be degraded. However, drinking water standards do change with time toward health-based levels. Under California law, drinking water standards must be periodically reviewed and adjusted to as close to health-based levels as is feasible. The Regional Water Board’s groundwater quality standards are designed to protect future drinking water uses when drinking water standards are likely to be more stringent.

Drinking water standards are not designed to protect other beneficial uses of groundwater, such as sprinkler irrigation of sensitive crops. It is well known that highly mineralized municipal drinking water can cause substantial harm to houseplants. For these reasons, the State and Regional Water Boards adopt water quality standards to protect the quality of California’s water resources for all present and probable future beneficial uses.

The Regional Water Board is charged with protecting the water resources of the Central Valley, including the largest contiguous groundwater basin in the State and the second largest groundwater basin in the United States. According to Department of Water Resources figures, approximately 74 percent of California's groundwater demand is supplied by Central Valley aquifers. Current and future beneficial uses of this basin that must be protected include household use as well as municipal, agricultural and industrial uses.

Proponents of Aquifer Storage and Recovery projects cite studies that show disinfection byproducts to be degraded or adsorbed within the aquifer. Injected water contains trihalomethanes and haloacetic acids. But, in some studies, these chemicals are not found when the water is extracted. However, the literature shows site-specific variability and is not conclusive. Site-specific data are needed to verify these claims.

The above issues were discussed in more detail in the ASR Issues staff report for the 9 September 2004 Regional Water Board meeting. That report is available on the Board's web site at <http://www.waterboards.ca.gov/centralvalley/tentative/0409/index.html>.

General Regulatory Strategy

To address these concerns while not impeding the ability of ASR projects to increase California water supplies, the Regional Water Board staff has developed a general regulatory strategy. It directly addresses a request of ASR project proponents – that the Board would only be concerned with residual effects of the ASR project on groundwater quality and beneficial uses.

A “bubble” or zone of injected water around the well or well field would be defined. Within the bubble, only Department of Health Services drinking water source regulatory requirements would be applied, including primary and secondary maximum contaminant levels (MCLs). Water quality objectives from the Basin Plan to protect groundwater quality for *all* beneficial uses would be applied at and beyond the edge of the bubble. Violation of water quality objectives within the bubble would be permissible during the pilot or test phase, where the impact would be of limited nature, extent and duration, and during the full-scale project, where other uses or users are precluded. Full compliance with water quality objectives, even within the bubble, would be required at cessation of the ASR project. Some water quality degradation outside the bubble would be consistent with State Water Resources Control Board Resolution No. 68-16, the Antidegradation Policy, due to the benefit of increased water supply created by a public entity.

ASR project proponents would be required to characterize the quality of injected water, including disinfection byproducts and potentially harmful constituents present in the raw source water. Groundwater quality would also be characterized to provide a baseline from which to assess impacts of the ASR project. A survey of current water users would also be conducted to determine the project proponent's degree of control over water use within the bubble.

Under California water law, groundwater and surface waters are not owned by any one entity. They are resources of the people of California as a whole. Outside the bubble, groundwater may have other users and other beneficial uses. To limit the extent of groundwater quality impacts, ASR project proponents would be required to delineate the size of the bubble and to demonstrate control over water within the bubble. Other uses and users of the water within the bubble would need to be prevented through

appropriative water rights or institutional controls. In this manner water quality impacts would be prevented from adversely affecting other groundwater users and uses. The project proponent would also need to demonstrate that degradation and/or dilution would reduce constituents of concern in the injected water to below Basin Plan groundwater quality objectives as it reaches the edges of the bubble. Pilot studies would be used to make this site-specific demonstration.

To verify control of the bubble and compliance with water quality conditions, ASR project proponents would be required to monitor water quality within and around the edge of the bubble. There would be consequences for violation of water quality conditions. If DHS drinking water requirements are violated, loss of control occurs, or residual water quality impacts from the project threaten to impair other water users/uses, a contingency plan would already be in place to address them. Contingency measures could involve pumping out injected water or otherwise providing aquifer remediation.

The proposed regulatory mechanism to implement this general strategy would consist of two parts:

- 1) A waiver of waste discharge requirements, including the aforementioned conditions; and
- 2) A monitoring and reporting program (MRP) to determine compliance with the conditions.

Regional Board staff has been negotiating with the City of Roseville to bring their ASR project under this new regulatory strategy.

There are two phases of ASR projects where these regulatory mechanisms would be used. During the pilot or test phase, waiver conditions would require verification that in-situ attenuation and/or dilution of constituents of concern will meet water quality objectives at some distance from the well or well field and within a zone under the control of the project proponent. This effort would delineate the size of the bubble. Waiver conditions would limit the nature, extent and duration of water quality impacts from the pilot phase. Water quality objectives must be met at the end of the pilot phase of the project. Monitoring would be required within the bubble to demonstrate compliance with DHS drinking water requirements and at the edge of the bubble to demonstrate compliance with water quality objectives. If the pilot phase does not lead to a full-scale project, waiver conditions would require removal of water quality impacts in violation of water quality objectives, even within the bubble. Implementation of an in-place contingency plan would be required within a reasonable period (e.g., 30-days) to correct violation of any of the waiver conditions.

Prior to full-scale operation of an ASR project, the project proponent would delineate the proposed bubble size and location based on the pilot studies, demonstrate that other water users within the bubble do not exist and are precluded by appropriative water rights or institutional controls for the duration of the project, develop a monitoring program, develop a contingency plan to address and correct water quality violations, in addition to demonstrating compliance with the California Environmental Quality Act (CEQA). Waiver findings for the full-scale phase would document the above information and would describe the limited nature and extent of water quality impacts due to demonstrated attenuation and/or dilution within the aquifer. Waiver conditions would require compliance with DHS drinking water source requirements, including MCLs, within the bubble; compliance with water quality objectives at and beyond the edge of the bubble; compliance with water quality objectives throughout the aquifer at cessation of the project; and implementation of the in-place contingency plan within a reasonable period (e.g., 30-days) to correct violation of waiver conditions.

Spreading Basin Projects

Conjunctive use projects where surface water is percolated into the subsurface using spreading basins, rather than direct injection, should generally be considered to be of low priority for Regional Board involvement. Significant water quality impacts are likely only where poor-quality source waters are proposed for use and where the unsaturated zone is not capable of attenuating constituents of concern. The benefits of increased water supply should outweigh the impact of minor changes in groundwater quality resulting from these projects. Where no or only minor impact on water quality is likely, spreading basin projects would not be formally regulated by the Regional Board. For staff to be able to make this determination, project proponents should be required to submit source water and receiving groundwater quality information, along with general information about the project.